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## AFRICAN AND AMERICAN OLIGOCHAETA IN THE AMERICAN MUSEUM OF NATURAL HISTORY

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The Oligochaeta kindly intrusted to me for examination by The American Museum of Natural History of New York include some very interesting forms, mostly from Central Africa. From one point of view, the material disappointed me. I had hoped to find among the Oligochaeta of the American Museum some new endemic species from the West Indies, which would fulfill my long-felt desire to advance our scanty knowledge of this rapidly disappearing fauna. There was, in fact, in the collection an endemic oligochaete from Haiti, but of an already known species. I take this opportunity to urge the importance of a prompt examination of the oligochaete fauna of the West Indies.

I wish to express my heartiest thanks to Dr. W. G. Van Name, as well as to Dr. G. E. Gates, through whom my wish to examine these specimens was made known to the authorities of the American Museum.

The following are the species especially dealt with in this paper, six of them being new.

<i>Andiorrhinus duidanus</i> , new species	Venezuela
<i>Alma basongonis</i> Michaelsen	Belgian Congo
<i>Dichogaster chapini</i> , new species	Belgian Congo
<i>Dichogaster navana</i> , new species	Belgian Congo
<i>Dichogaster godeffroyi</i> Michaelsen	Haiti
<i>Dichogaster itoliensis</i> Michaelsen	
forma <i>typica</i> Michaelsen	Belgian Congo
forma <i>moorei</i> (Beddard)	Belgian Congo
<i>Stuhlmannia congica</i> , new species	Belgian Congo
<i>Eminoscolex navanus</i> , new species	Belgian Congo
<i>Eminoscolex langi</i> , new species	Belgian Congo

Another new specific name is also established: *Stuhlmannia mayiliensis*, for *Platydrilus inermis* Michaelsen, 1910, on account of pre-occupation.

***Andiorrhinus duidanus*, new species**

Figure 2

LOCALITY.—Southern Venezuela, Cerro Duida, north of the upper Orinoco, about 66° west long., 3° 12' north lat., at the summit, 5500 ft., "Provisional Camp"; Tyler Duida Expedition.

<sup>1</sup> Hamburg.

**MATERIAL AVAILABLE.**—A sexually mature, complete specimen, and a half-mature, incomplete one. Type, Cat. No. 2249, American Museum of Natural History.

**DESCRIPTION.**—Dimensions of the complete specimen: length about 100 mm., thickness 3 to 5 mm., width at the clitellum 6 mm., number of segments about 146.

Color brown, dorsally very dark, ventrally a little lighter.

Head probolous. Prostomium high, dome-shaped, somewhat longer than thick. A very short basal part of it is pulled into the buccal cavity (early state of the formation of a proboscis?).

Setae beginning both ventrally and dorsally at the third segment, paired; in general *aa* is smaller than *bc*, *dd* about equal to half the circumference of the body. Behind the middle of the body *aa:ab:bc:cd:dd* is approximately 3:1.5:1:17. The setae are slightly S-shaped, the simple, acute, extreme ectal end is bent to a small hook, which forms an angle of about 80° with the middle part of the seta. Somewhat beneath this hook the seta is sparingly ornamented by some broad, shallow depressions with sharp ental borders and slightly concave ectally. The setae are in general rather large, about 1 mm. long, and in the middle about 55 $\mu$ , at the ental end about 70 $\mu$  thick. Those of the fore end are somewhat smaller, but not properly called slender, as they are in other species of this genus; a seta from segment VI being 0.6 mm. long, and 36 $\mu$  thick.

Clitellum on segments XVI to XXIV (= 9); on segment XVI and XXIV less developed, on the other segments very prominent and distinctly broadened. It is saddle-shaped, interrupted in the median ventral part. The sharp borders of the middle part of the clitellum lie just lateral to the lines of the setae *b* and are bent off laterally at the fore and the hinder ends of the clitellum.

Longitudinal walls of puberty are not distinctly developed, but there seemed to be a somewhat lighter longitudinal stripe at each border of the clitellum, extending over the five segments from XIX to XXIII.

Male and female pores not distinguishable.

Spermathecal pores indistinct; three pairs situated at the intersegmental furrows VI/VII, VII/VIII and VIII/IX, and median to the lines of setae *a*. The ventral part of segments IX and VIII, and to a less extent that of segment VII, is somewhat thickened and glandular.

Clitellar sexual setae about 2 mm. long, in the ectal half nearly straight, in the ental half slightly bent; 40 $\mu$  thick in the middle portion, and about 60 $\mu$  thick at the ental end; the thickness diminishing only a little to about 35 $\mu$ , toward the ectal end. The extreme ectal end is again a little thickened and finally ends in an acute, beak-shaped point. The ectal half of the sexual seta with the exception of the beak-shaped extreme end is ornamented by four longitudinal rows of rather deep scars which are bordered entally by a sharp, ectally concave, nearly semicircular rim, while they slightly flatten toward the ectal end. The scars of adjacent rows alternate, but not quite regularly. The scars of one row, about 30, are rather closely arranged. The segments of the seta marked by two successive scars are shorter than the thickness of the seta.

The spermathecal sexual setae: The ventral setae of segments VII and VIII correspond in form and ornamentation to the clitellar ones, but are somewhat smaller, those of the VIII segment being only 1.5 mm. long. These spermathecal sexual setae correspond to the normal setae *a* and *b* but are displaced medially, and those of each pair are closely approximated.

The septa, present from intersegmental furrow VI/VII, are all very slightly developed. No thickened septum in the region anterior to the gizzard was recognizable.

Intestinal canal: A large, nearly globular gizzard in segment VI, three pairs of irregularly pear-shaped chylous pouches in segments VII, VIII, and IX. They are lamellar pouches, each with about 30 lamellae, which are not everywhere quite regularly formed. I could not recognize any appendages at the pouches. The intestine bears a broad ribbon-shaped typhlosole. A transverse section of it has a narrow, only slightly bent contour, not broadened either at the basal or at the distal end.

Nephridia with a minute, somewhat elongate muscular sphincter completely embedded in the body wall.

Male organs: Two pairs of testis sacs ventrally placed in segments X and XI, those of one segment apparently communicating in the median line, each containing a large funnel in its median hinder part. The testis sacs are continued in large testis-sac appendages, those of one pair embracing the intestine, joining on its dorsal aspect, but apparently without communicating with each other there. From the testis sacs of the hinder pair some small, dome-shaped or nearly globular appendages extend out, probably entering segment XII, and representing seminal vesicles.

Spermathecal organs (Fig. 2): The spermathecae of the anterior pair are distinctly smaller, those of the posterior pair larger than those of the middle pair. Ampulla elongate sac-shaped or bulb-shaped, always rather shriveled. Duct cylindrical, irregularly bent, thinner and shorter than the ampulla, from which it is generally not sharply set off. The ectal part of the duct is somewhat flattened and opens out in a simple manner, through the slitlike spermathecal pore. The structure of the spermatheca is peculiar. The ampulla is thin and smooth-walled, with slightly developed muscles. The wall of the duct is a little thicker, externally smooth, with a moderately thick, irregular layer of muscles. Internally it is uneven, as the cylindrical cells of its epithelium are of different lengths and prominent to different degrees. These cells do not seem to form a close layer, and in the small gaps between them are affixed numerous spermatozoa by their head ends, which are stained dark purple by haematoxylin-eosin. The tails of these, which are feebly stained light red, project into the lumen of the duct entally toward the ampulla, partly even entering the basal part of the latter. There are no typical seminal chambers in the wall of the duct, but all spermathecae examined in a series of slides showed, in three cases distinctly, a peculiar structure, which I must consider as the homologue of a seminal chamber (*sr*). Somewhat entally from the ectal end of the duct there is a lentiform cavity in its fore-side, communicating by a broad opening with the lumen of the duct, and formed only by a decrease in the thickness of the wall. On the outer surface of the duct there is no indication of this cavity, the surface being quite even. The inner surface of this cavity is densely crowded with spermatozoa, just like the other parts of the duct, perhaps somewhat more densely and more regularly than the latter. Medially from each spermatheca there lies a sac-like organ (*ag*) much smaller than the neighboring spermatheca, to whose duct the narrower ectal part of this sac-like organ is closely attached. These organs have a moderately thick wall with apparently irregularly arranged muscles, and a moderately thick, irregular epithelium, the cells of which seem to be glandular. The lumen is rather wide, partially filled by granular and fibrous material, doubtless a secretion of the epithelium. In this material remnants of the epithelial cells are still to be seen. I could not see distinctly the opening of these sac-like organs, but I believe I saw some narrow fissures in the wall of the organ,

leading outward through the glandular body wall in the vicinity of the spermathecal pores. These are doubtless homologues of certain organs of *A. amazonias* Michaelsen (1917, p. 211) and of *A. rubescens* Michaelsen (1925, p. 288) which I regarded as evertable copulatory pouches. In this new species they do not appear to be evertable. I therefore consider it better to call them accessory glandular pouches. Finally, in segments VII and VIII the sacs of the spermathecal sexual setae with their accessory glands are located, attached to the spermathecal apparatus. These organs lie in the two gaps between the three spermathecas. These sexual setae of segments VII and VIII, corresponding to the normal setae *a* and *b*, have each a separate setal sac, but the two sacs of each pair are closely approximated and are joined by a short muscle bundle at their ental ends. The glands joined to these sexual setae project medially from them far into the coelom. Those of the segment VII are moderately large and simple, although externally uneven or even lobed, those of the segment VIII are larger and two-lobed, cleft nearly to their bases.

REMARKS.—*A. duidanus* is nearly allied to *A. amazonias* Michaelsen (1917, p. 206, Pl. II, fig. 22; 1921, p. 23) and to *A. rubescens* Michaelsen (1925, p. 285), both of which come from the Amazon region. With these, it has in common the possession of accessory glandular pouches on the spermathecas; with *A. amazonias*, moreover, it agrees in the shape of the normal setae. The new species is distinguished from those species by the shape of the spermathecas and the peculiar manner of storing the spermatozoa in them, as well as by the characteristic ornamentation of the sexual setae. In the dimensions of the normal setae no one of the older known species equals this new one. Only *A. pictus* Michaelsen (1925, p. 280) comes near to it, its normal setae being as long as 0.8 mm.

#### ***Alma basongonis* Michaelsen**

*Alma basongonis* MICHAELSEN, 1936.

LOCALITY.—Belgian Congo, Stanleyville, middle Congo, 0° 30' north lat., 25° 10' east long., Lang-Chapin Congo Expedition, February, 1915.

FURTHER DISTRIBUTION.—Belgian Congo, Basongo, 4° 30' south lat., 20° 15' east long.

MATERIAL AVAILABLE.—Many specimens found in company with another, larger species of *Alma*, which is represented only by immature specimens not sufficient for determination.

#### ***Dichogaster chapini*, new species**

Figures 5, 9

LOCALITY.—Belgian Congo, Medje at the river Nava, northern affluent of the Aruwimi; 2° 25' north lat., 27° 20' east long.; Lang-Chapin Congo Expedition.

MATERIAL AVAILABLE.—Four mature specimens and some immature ones. Type, Cat. No. 2250, American Museum of Natural History.

DESCRIPTION.—Dimensions of the mature specimens: length 50–60 mm., thickness 2.5 to 3.5 mm., number of segments 80–210.



Color brown.

Body cylindrical, head epilobous, prostomium very small, its dorsal appendage triangular, the hinder angle just reaching the annulation-furrow of segment I. Segments anterior to the clitellum indistinctly annulated, 2- or 3-ringed.

Setae rather slender, strictly paired; in general *aa* a little larger than *bc* (less in the clitellar region?), *dd* distinctly greater than half the circumference of the body. At the middle part of the body *aa:ab:bc:cd:dd* approximately equals 13:1:11:1:96; *dd* = seventeen-twelfths of *u*.

First dorsal pore at the intersegmental furrow VIII/IX if not at VII/VIII.

Clitellum indistinctly limited, including segments XIII to XXII or XXIII (= 10 or 11), but at segment XXII only feebly developed, and at XXIII, at the most very feebly and only dorsally. The clitellum is ring-shaped at segments XIII and XIV; further behind it is more feebly developed, if not interrupted for a short distance on the median ventral aspect.

Male field forming a small four-sided depression extending median-ventrally between the middle zones of the segments XVII and XIX. Laterally it extends nearly to the rows of setae *a*. The four corners of this depression reach to the centers of two pairs of moderately large whitish circular gland areas or more or less prominent glandular cushions, situated in the lines of setae *ab* in the middle zone of segments XVII and XIX; these are the prostate poropores. The prostate pores lie in the centers of these poropores, and those of one side are connected with one another by sharply impressed seminal furrows. The seminal furrows are curved toward the median line at the ends, but laterally convex in the middle parts. There are no accessory longitudinal walls of a glandular nature. The male pores are situated at the top of minute papillae in the bottom of the seminal furrow, somewhat in front of the middle of them, and just behind the intersegmental furrow XVII/XVIII, nearer to the fore pair of prostate pores than to the hinder pair.

Spermathecal pores quite indistinct; there are two pairs situated at the intersegmental furrows VII/VIII and VIII/IX in the rows of setae *a*.

Septa V/VI and VI/VII very thin, VII/VIII a little thickened in the middle part, VIII/IX moderately strong, IX/X and XI/XII rather strong, XII/XIII and XIV/XV by degrees thinner, the succeeding ones thin.

Alimentary canal: Two rather large gizzards in segments V and VI, and three pairs of nearly equally large chylous pouches, lamellar pouches, lateral to the oesophagus in segments XV to XVII. They are widely kidney-shaped with some indentations on the convex margin. Intestine with a simple, irregularly meandering typhlosole, narrowly triangular in cross section, with a sharp edge.

Excretory organs: There are four rather regular longitudinal rows of meronephridia, at least in the middle part of the body, on each side. Those of the three upper rows are rather large, simple, flattened sac-shaped; those of the lowest row are not simple, but apparently divided into a few smaller meronephridia, which are not sac-shaped. Perhaps these are connected with one another. The number of meronephridia in half a segment must therefore be regarded as four, if not as a few more, according as those of the lowest row are taken as one or as several.

Anterior male organs holandrous. Two pairs of small tufted testicles project backward from the ventral margin of septa IX/X and X/XI. Opposite them, at the ventral part of the septa X/XI and XI/XII, lie two pairs of high-rimmed, cup-shaped male funnels. Spermatogems fill laterally and dorsally nearly the whole

coelom of segments X and XI, forming thick masses, especially in the dorsal parts. I could recognize no membrane enveloping the testicles, the male funnels and the spermatogems, i. e., no testis sacs. All these organs seem to lie free in the coelom. One pair of grape-like seminal vesicles project from septum XI/XII into the twelfth segment.

Posterior male organs: Two pairs of nearly equally large prostates in segments XVII and XIX. The glandular part is whitish, tubular, about 0.16 mm. thick, very long, irregularly coiled, with a very narrow axial channel. Duct sharply set off from the glandular part, very much shorter, though relatively rather long, tubular, about 0.05–0.06 mm. thick, muscularly lustrous. Each prostate is accompanied by a penial-seta sac, containing a single penial seta. Penial setae slender, switch-shaped, about 1.5 mm. long, in the ectal half very thin (7–9 $\mu$ ), in the ental half, especially at the inner end thicker (as much as 25 $\mu$ ). Ental half simple, moderately bent, ectal half, with exception of the extreme end (about the sixth part of the whole seta) nearly straight; the extreme ectal end slightly bent, nearly sickle-shaped, simply pointed and rather acute. With exception of the sickle-shaped end and a short adjacent part, the ectal half shows a slight, rather regular serpentine undulation, the amplitude of which nearly equals the width of the seta. I counted about eight or nine undulations, which become less distinct at the end of this serpentine part and which are distinctly visible only in a certain position of the seta, and are more or less indistinct if this position is altered. The thin fibrous axis of the setae shows this serpentine undulation in a lesser degree, but is not quite straight. Even with strong magnification I could not recognize any external ornamentation, spines, scales or scars, on the penial seta. The surface seemed to be quite smooth. The ectal ends of the male ducts are not thickened, the extreme ends piercing through the body wall even get thinner.

Female organs: A pair of very large pear-shaped ovaries project from the ventral border of septum XII/XIII into the thirteenth segment. The apparently mature egg-cells of the ovaries are exceedingly large, about 0.1 mm. in diameter. The female funnels, lying opposite to the ovaries, are conical cups. The oviducts are moderately long, quite straight, very narrowly conical, rather thick at the ental end, getting thinner toward the ectal end.

Spermathecae (Fig. 9) all nearly equally large. Ampulla rather small, sac-like or pear-shaped, set off from the middle part of the spermatheca by a neck-like constriction. The middle part is about as thick as the ampulla, somewhat shorter than the slender muscular duct, from which it is set off more or less sharply. In five of the seven spermathecae which I could examine, there lay, besides the ental end of the ectal muscular duct, two small pear-shaped diverticula close together and hanging down ectally, discharging through a short, narrow common stalk into the ectal end of the middle part of the spermatheca. Each diverticulum contains a nearly globular ball of sperm. In two of the seven examined spermathecae there was only a single pear-shaped diverticulum. All spermathecae were more or less crooked or curved.

#### ***Dichogaster navana*, new species**

Figures 3, 8

LOCALITY.—Belgian Congo, Medje at the river Nava, northern affluent of the Aruwimi, 2° 25' north lat., 27° 20' east long., Lang-Chapin Congo Expedition.

MATERIAL AVAILABLE.—A single, rather softened specimen. Type, Cat. No. 2251, American Museum of Natural History.

DESCRIPTION.—Dimensions: Length 80 mm., thickness 3–3.5 mm.; number of segments about 10.

Color light brown, dorsally hardly darker than ventrally, a little iridescent.

Head? (prostomium drawn in). Segments rather regularly three-ringed, some anteriorly adjoining the clitellar region divided by narrow secondary ring-furrows into four or five annules.

Setae very slender, strictly paired, all situated ventrally;  $aa = bc$ ,  $dd = \frac{3}{4}u$  (approximately).

Clitellum ring-shaped, at segments XIII to XIX (= 7); at segment XIII very poorly developed.

Male field restricted to the two anterior thirds of segment XVIII. It is a transverse depression with a spindle-shaped contour, with a higher anterior border, which exhibits two deep incisions.

Prostate pores one pair, situated in the lateral parts of the male field (in the lines of setae  $a?$ ), in or near the middle zone of the segment XVIII. Male pores not recognized.

Spermathecal pores inconspicuous, one pair situated ventrally at the inter-segmental furrow VII/VIII.

Septa VI/VII to X/XI very thin, XI/XII and XIII/XIV distinctly thickened, but still to be called only moderately thick, the succeeding ones thin.

Alimentary canal: Two rather large barrel-shaped gizzards anterior to the sexual region (in the fifth and sixth segment?). Three pairs of broadly kidney-shaped chylous pouches, which are lamellar pouches, with some rather deep incisions in the convex border, in segments XV, XVI and XVII, those of the middle pair larger than the anterior, but smaller than the posterior ones. The latter discharge independently, those of the two anterior pairs seem to discharge by a common duct into the oesophagus (not distinctly seen!). Intestine with a broad lamellar typhlosole which is simple, at least in the middle part of the body.

Excretory organs (nearly macerated): Apparently six or seven sac-like meronephridia in each side of a segment.

Anterior male organs holoandrous. Two pairs of plate-like testis sacs, ventrally situated in the tenth and eleventh segments, the whole ventral part of which they occupy. Those of one side touch one another and are separated only by a thin septum; those of one segment are joined together in the median ventral line, indicating that each pair originates by a median ventral longitudinal furrow. Two pairs of wide male funnels, those of the tenth segment in the hinder parts, those of the eleventh segment in the middle part of the respective testis sac. A pair of wide sac-like seminal vesicles depend from septum XI/XII into the twelfth segment. I could not recognize seminal vesicles in the eleventh segment. The seminal vesicles as well as the testis sacs contain many nearly globular parasites (sporocysts).

Posterior male organs: One pair of prostates in the eighteenth? segment. The glandular part is whitish, very long, thinly tubular, and densely coiled. Duct sharply set off, very much thinner and shorter, though of moderate length, with a feeble muscular luster. Each prostate opens together with a penial setal sac, which contains apparently only one penial seta. Penial seta (Fig. 3) about 2 mm. long; at the ental end about  $60\mu$  thick, in the middle, about  $35\mu$  thick; toward the ectal end the thickness diminishes to  $15\mu$  a little before the tip. The seta is very slightly bent in the ental half, irregularly bent in the ectal half; the ectal quarter being bent in an

obtusely rounded angle. The ectal tip is simple, somewhat bent into a hook. The penial seta has a characteristic ornamentation. In the ectal sixth part of the seta this consists of widely scattered, triangular, ectally inclining fine spines. Entally the spines become somewhat more dense and somewhat slenderer; the lateral borders of the spines are continued into the interior of the seta by structural lines nearly reaching the axis of the seta. An optical longitudinal section through the seta shows in consequence a rather dense hatching of entally converging lines.

Spermatheca (Fig. 8): Ampulla small, widely pear-shaped, set off from the middle part of the spermatheca by an insignificant neck-like constriction. Middle part expanding ectally, finally becoming somewhat thicker than the ampulla, about twice as long as the latter. Externally it is not sharply set off from the muscular duct, which is distinguished from it only by its muscular luster. The wall of the middle part is rather thin, but its wide lumen is narrowed in places by some longitudinal membranes projecting from the inner side of the wall. Muscular duct about as long as the ampulla and middle part together, and becoming thinner only at the ectal end. Its wall is thick, muscular, its axial lumen very narrow and simple. At the ental end of the muscular duct, and projecting a little over the middle part also, a blunt, nearly globular diverticulum, which is nearly as thick as the muscular duct and its middle part depends from the spermatheca. The diverticulum is joined to the spermatheca by a rather broad base, and inclines somewhat entally. It contains a large, but not simple sperm chamber. The ental pole of this sperm chamber is divided by a deep cleft into two equally large parts, which join together ectally and are continued by a narrow channel. This latter is bent entally, thus passing the basis of the diverticulum entering the wall of the muscular duct, and finally discharging into the ectal end of the middle part of the spermatheca.

REMARKS.—*D. navana* is characterized principally by the singular reduction of the sexual organs, which are neither strictly microsclecin nor strictly balantini, but exhibit an intermediate stage between these two ordinary forms of reduction.

#### *Dichogaster godeffroyi* Michaelsen

*Benhamia godeffroyi* MICHAELSEN, 1890a, p. 5.

*Dichogaster godeffroyi* MICHAELSEN, 1900, p. 354; 1908, p. 22, Pl. I, figs. 2, 3; 1934, pp. 63–64.

LOCALITY.—Haiti, Sanchez, March 6, 1915.

FURTHER DISTRIBUTION.—Haiti, Puerto Plata and Plaisance (according to Michaelsen, 1900 and 1908).

MATERIAL AVAILABLE.—A mature specimen, 65 mm. long, and a much smaller, half-mature one.

REMARKS.—The first distinct dorsal pore lies on the intersegmental furrow XII/XIII, a seemingly still closed pore at XI/XII [in the specimen from Plaisance each one segment more anteriorly].

The clitellum is saddle-shaped, ventrally interrupted, without sharp borders, at the segments XIII to XX (= 8) [in the specimen from Plaisance at the segment XIII (XIV) to XIX (= 6, if not 7)].



The male field shows a peculiarity not seen in the specimens previously examined. There are no longitudinal glandular walls accompanying the seminal furrows, but median-ventrally at each of the segments XVII and XIX is a longish, transversely oval, whitish glandular patch, occupying the whole length of the segment, and reaching laterally nearly as far as to the lines of setae *c*. The ends of the seminal furrows intrude into these glandular patches, which are well developed, especially in the half mature specimen. The seminal furrows are convex toward the median line as in the type specimen, not straight as in the specimen from Plaisance. This difference is perhaps not due to variability, but presumably caused by different post-mortem contraction.

The chylous pouches are much flattened kidney-shaped, with two or more deep incisions in the convex border.

The number of meronephridia may attain to eight in each side of a segment.

Remarkable is the length of the prostate ducts, which form some wide, regular serpentine undulations; those of the larger prostates in segment XVII being about 3 mm. long.

I could recognize no trace of penial seta in the new mature specimen, but I dare not assert that they were totally missing; they may have been torn out during copulation.

As for the spermathecae, I can confirm my note from 1934 (p. 64). In one of the larger hinder spermathecae as well as in a smaller one of the anterior pair, there were in each of the diverticula two or three seminal chambers, two of which lie one above the other, the smaller third one, sometimes present, lies beside them. The largest spermathecae are about 0.2 mm. wide.

### ***Dichogaster itoliensis* Michaelsen**

#### *Forma typica*

*D. jaculatrix* BAYLIS, 1915, p. 451.

LOCALITIES.—Belgian Congo, Medje at the river Nava, northern affluent of the Aruwimi, 2° 25' north lat., 27° 20' east long.; Lang-Chapin Congo Expedition, Niapu, November, 1913.

REMARKS.—*D. jaculatrix* Baylis from Ituri is identical with this widely distributed form, which is represented in nearly all collections from the northeastern Belgian Congo, from Uganda and the whole region of the Victoria Nyanza, and also in the present collection by many lots. Only the localities new for this form are noted above.

Forma *moorei* (Beddard)

LOCALITIES.—Belgian Congo, Lusonga in the Kivu district, 6000 ft., Chapin, Sage and Mathew Expedition, June, 1927.

## STUHLMANNIA MICHAELSEN (emended)

*Stuhlmannia* MICHAELSEN, 1890, p. 24.

*Platydrilus* + *Stuhlmannia*, MICHAELSEN, 1891, pp. 11, 13.

*Metschaina* + *Stuhlmannia*, MICHAELSEN, 1903, pp. 462, 467.

DIAGNOSIS (emended).—Setae paired. Male pore unpaired, in segment XVII or in the intersegmental furrow XVI/XVII or XVII/XVIII. Spermathecal pore unpaired, in the spaces between the intersegmental furrows XII/XIII and XIV/XV. Female pores paired, laterally placed in segment XIV. A gizzard in the fifth segment. Paired oesophageal appendages resembling fat bodies in the sixth segment and some subsequent ones. Sexual organs holoandrous. Spermatheca unpaired, in connection or communication with the female organs, or if separated from them, at least near them.

TYPE.—*Stuhlmannia variabilis* Michaelson, 1890, p. 24.

REMARKS.—In the older diagnosis *Stuhlmannia* was distinguished from *Platydrilus* (including *Metschaina*) on the ground that the ovaries were enclosed in coelomic tubes, while in *Platydrilus* they were said to lie free in the thirteenth segment. I now can no longer maintain the separation of these genera. The female apparatus and its connection with the spermatheca, as well as the forming of coelomic tubes and sacs is in this group so manifold, that it is not possible to draw a clear line of separation between them. It is principally a geographical circumstance, which decided me. The majority of the species of this group, about twenty-one species, are endemic in East Africa, westward as far as to the river Aruwimi (about 27° east long.) to Tanganyika (about 29° east long.), and to the Victoria falls of the Zambesi (about 26° east long.). Only in one direction, along the river Congo, four species of this group have extended farther westward into the Atlantic coastal region. These are, the new species *Stuhlmannia congica* (see below) from Stanleyville on the Congo (about 25° east long.), and three species from the coastal region close to and north of the mouth of the Congo, as follows: *Platydrilus inermis* Michaelson (1910, p. 116) from Mayili in Belgian Congo (about 12° 30' east long.) which must now be called *Stuhlmannia mayiliensis* nov. nom., as *St. inermis* Stephenson has priority; *Platydrilus hortensis* Michaelson (1910, p. 118) and *Stuhlmannia* [*Platydrilus*] *sandersi* Michaelson (1910, p. 120, and 1913, p. 21), both from the river Chiloango in the Portuguese Congo (about 12° 8' east long.). These four Congo species differ in a remarkable point from the twenty-one East African species. In the latter the spermathecal pore lies, with much constancy, in segment XIII behind the intersegmental furrow

XII/XIII, at most going backward as far as the intersegmental furrow XIII/XIV, whereas in all the four Congo species this pore lies outside of segment XIII, mostly farther back (in *St. sandersi* and *Platydrilus inermis* [*Stuhlmannia mayiliensis*] at the intersegmental furrow XIV/XV, at *St. congica* at the intersegmental furrow XV/XVI, only in one species (*Platydrilus hortensis*) more anteriorly (at the intersegmental furrow XII/XIII). As *Pl. hortensis* is obviously allied to *Pl. inermis* [*Stuhlmannia mayiliensis*], I discussed the question of uniting it to the latter as a subspecies, for it is evident that the situation of its spermathecal pore means only an instance of atavism, overlapping a little the original space determined by the twenty-one East African species. It is clear that the four Congo species form together a group of near allies. Incidentally this destroys justification for separating *Stuhlmannia* and *Platydrilus*, for in this small group there are species showing both characters: with free and with enclosed ovaries.

***Stuhlmannia congica*, new species**

Figures 4, 6, 7

LOCALITY.—Belgian Congo, Stanleyville, 0° 30' north lat., 25° 10' east long. found in the company of two different species of *Alma*, therefore presumably limnetic; Lang-Chapin Congo Expedition, 1915.

MATERIAL AVAILABLE.—Many well-preserved specimens. Type, Cat. No. 2252, American Museum of Natural History.

DESCRIPTION.—Dimensions of mature specimens: length 40–60 mm., width in the smallest 0.6–1.2 mm., in the largest 0.6–1.5 mm. The middle part of the fore body, which is sometimes a little swollen, may be as wide as 1.8 mm. Number of segments 100–114.

Color warm brown, more or less dark dorsally, but only a little darker than ventrally.

Form slender; the middle and the hinder body especially so.

Head epilobous (about  $\frac{1}{3}$  to  $\frac{1}{2}$ ). Prostomium rounded, its dorsal appendage nearly quadrate, the acute posterior corners connected by a transverse furrow. Outlines of the appendage are continued backward by more or less distinct longitudinal furrows reaching at the most to the middle zone of segment I.

Segments simple, without secondary annulation furrows.

Setae rather stout, rather strictly paired; approximately  $aa:ab:bc:cd = 1:3:1:3$ ;  $dd =$  about four-sevenths of  $u$ .

Clitellum (Fig. 7) from  $\frac{1}{3}$  segment XIII or XIV to  $\frac{1}{4}$  segment XVII or XVIII ( $= 4\frac{1}{4} - 4\frac{1}{2}$ ), distinctly saddle-shaped, ventrally interrupted, here sharply bordered by more or less distinct longitudinal furrows between the lines of the setae  $a$  and  $b$ . The ventral pairs of setae are situated just in these border lines, and usually the median ventral part of the body is somewhat depressed at these border lines, and somewhat convex in the space between them. The intersegmental furrows are nearly totally obliterated on the clitellum. The color of the clitellum is mostly dark purplish brown.

Male pore (Figs. 6, 7) situated median ventrally at segment XVII; an irregular cross- or star-shaped slit at the top of a circular, more or less prominent male porophore, which is sometimes somewhat inclined forward, the base of which occupies nearly the whole length of segment XVII.

Female pores (Figs. 6, 7) rather inconspicuous, but sometimes marked by dark points among minute spots, distinguished from the dark clitellum by their lighter color. The pores lie behind the setal zone of segment XIV, somewhat above the line of setae *b*.

Spermathecal pore (Figs. 6, 7) placed median-ventrally at the intersegmental furrow XV/XVI, a broad, deep transverse slit, anteriorly and posteriorly bordered by broad transverse prominences, which often are lip-like, and occupy the posterior half of the fifteenth and anterior half of the sixteenth segment as far as the zones of setae, laterally reaching the lines of seta *a*.

Accessory organs of puberty (Figs. 6, 7): A transversely square or transversely biscuit-shaped cushion of puberty on the median ventral anterior part of segment XVIII, laterally reaching the lines of setae *b*. At the anterior part of segment XIX a pair of circular cushions of puberty, corresponding in situation to the lateral enlargements of the biscuit-shaped cushion of segment XVIII. Sometimes there are narrower transverse cushions closely pressed together median ventrally on the posterior part of the sixteenth and, less distinct, on the fifteenth segment.

All these external sexual organs vary in degree of development, being sometimes only indistinct; most distinct in sharply contracted hardened specimens.

Septa V/VI to XI/XII thickened in their middle parts, V/VI to VIII/IX rather strongly, the subsequent ones gradually less thickened. Toward the ectal edge these septa become very thin. The septum XII/XIII is pushed backward, and inserted between the intersegmental furrow XII/XIII and the setal zone of the thirteenth segment. The septum XIII/XIV on the contrary, is displaced somewhat forward and perhaps made incomplete. From its ventral border it is inclined obliquely forward and in about the middle of its height joined to the septum XII/XIII, thus reducing the thirteenth segment to a small ventral chamber, an ovarian chamber. In some slides I believe it possible to see that the thin membrane, the somewhat questionable septum XIII/XIV, after its connection with septum XII/XIII again separates itself from the latter, and continues to form a dorsal part of septum XIII/XIV, inserting itself dorsally and posteriorly on segment XIII. But this could not be seen clearly.

Alimentary canal: A moderately large gizzard in the fifth segment. Oesophagus narrow, tubular and of equal diameter throughout. From its wall bolt-shaped processes regularly arranged in annulations project into the lumen. In segments VI to VII seven pairs of appendages resembling fat bodies, and each containing a blood-vessel, depend laterally from the oesophagus.

Anterior male organs holoandrous. Two pairs of testes and male funnels ventrally in segments X and XI embedded in free masses of spermatogems. Two pairs of short multiple seminal vesicles with large chambers depend from the septa X/XI and XI/XII into segments XI and XII.

Posterior male organs (Fig. 6): Euprostates (*eu*) sausage-shaped, straight or a little bent, about 1.6 mm. long and 0.3 mm. wide, entally regularly rounded, at the ectal and rather rapidly narrowed and united and continued into a common duct, which passes through the male porophore to discharge through the male pore as its end. Externally the euprostates are quite smooth, without luster. Their external



layer of muscles is very slight, the inner layer thick and seemingly glandular, the lumen is regular, simple and rather narrow, but not tubular; its contour in a transverse section is spindle-shaped or elongate and narrowly oval. The short, thin duct is more muscular, and has a very narrow axial channel. I could not surely demonstrate the entrance of the male ducts into the euprostates; but doubtless it occurs at or near the ental pole of the euprostate. The surface of the ental part of each shows two thin longitudinal walls, separated from each other by a short but distinct intermediate space. These walls were pressed outward by a very narrow male duct about  $30\mu$  thick, lying close beneath the external covering-membrane of the euprostate. I could follow the male ducts entally nearly as far as to the ental pole of the euprostate. Close beside and a little anteriorly to the male pores a pair of slender penial setal sacs (*ps*) discharge, each containing two penial setae. The penial setae (Fig. 4) are slenderly S-shaped, only a little bent in the ental half, the ectal half being bent somewhat more and in an opposite direction. They are about 1.3 mm. long, entally about  $38\mu$  thick, in the middle about  $34\mu$  thick, and slowly diminishing a little more toward the ectal part, ending in a simple, moderately acute tip. The ectal third of the seta is somewhat flattened in the plane of the curvature, but not broadened. The transverse section of this part of the seta has a slender oval contour. There is no trace of any sort of ornamentation.

Female organs (Fig. 6): Two slender ovaries of tuft-like form (*o*) are inserted close to the median ventral line (yet beneath the ventral nerve-cord) at the border of septum XII/XIII and extend obliquely laterally into the ventral chamber formed by the septa XII/XIII and XIII/XIV and representing presumably the whole thirteenth segment, or perhaps only the ventral part of it (see the description of the arrangement of the septa given above). The female ducts (*fd*), discharging laterally at the hinder part of the fourteenth segment, are very slender in their ectal part, thickening by degrees entally, and run forward in a slightly meandering manner, each forming here a moderately long and thick, narrow loop, which pierces the thin septum XIII/XIV and thus enters the ventral ovarian chamber. The backwardly extending ental branch of this loop bears at its ental end a little pear-shaped sperm chamber (*sr*), and then forms close to the septum XIII/XIV some short meanderings, and opens into the ovarian chamber by a narrow slit. This part of the organ represents the female funnel (*ff*). As in some other species of *Stuhlmannia*, the female organs are not built quite symmetrically. A normal egg sac (*es*) is formed only in the apparatus of one side, projecting from the female funnel backward into the fourteenth segment. It is externally very uneven, mulberry-shaped, with relatively large, freely projecting egg-chambers. A short, narrow tube with moderately wide lumen, coming from the female funnel, if not from the ental end of the female duct, enters the small central lumen of the egg-sac. The apparatus of the other side lacks an egg-sac totally, or has it represented only by a rudimental organ, containing no more than two or three egg-chambers. I could not recognize any communication or connection between this female apparatus and the spermatheca.

Spermatheca (*sp*) unpaired. The opening between the more or less prominent lips of the spermathecal pore leads into a thick muscular bulb (*sb*) with a narrow axial channel. This bulb projects into the middle part of a highly vaulted, rather broad spermathecal atrium (*sa*). The anterior part of this atrium pushes the thin septum XIV/XV forward. The wall of the atrium is moderately thick, not muscular, in general even and smooth. Only at the anterior part it shows a transformation;—

some projections and excavations, which are marked by shallow furrows. The anterior end of the atrium is not smoothly rounded. Apparently it is continued into a fibrous cord, if not into a tubular organ; but I could not detect any connection between this cord or tube and the ovarian chamber, which it seems to reach, but not to enter. At the posterior end the spermathecal atrium narrows, and is continued into a narrow (about 0.26 mm.) thin-walled, tube, which runs almost straight backward and finally ends in an apulla (*sp*) about 0.6 mm. thick. The whole spermathecal apparatus has a length of about 5 mm. Its lumen contains a long, nearly cylindrical theococyst, the hinder end of which, in the ampulla, is of capitate form, and the fore end, in the anterior part of the spermathecal atrium, is also considerably thickened.

***Eminoscolex navanus*, new species**

Figures 11, 12

LOCALITY.—Belgian Congo, Medje at the river Nava, northern affluent to the river Aruwimi, 2° 25' north lat., 27° 20' east long.; Lang-Chapin Congo Expedition.

MATERIAL AVAILABLE.—Three mature specimens and one half-mature one. Type, Cat. No. 2253, American Museum of Natural History.

DESCRIPTION.—Dimensions of the mature specimens: length 65 mm., thickness at the hinder body about two mm., at the fore-body as much as three mm. Number of segments 140–150. The half-mature specimen is very much smaller.

Color dorsally smoke brown, rather dark, gradually becoming reddish gray and lighter ventrally.

Head epilobous, nearly tanylobous. Prostomium small, heart-shaped. Dorsal appendage of prostomium long and very narrow, with parallel borders, which nearly reach the intersegmental furrow I/II but get very narrow and indistinct at the ends. Segments simple, not annulated.

Setae moderately stout, paired, the ventral ones very distant from each other, the dorsal ones rather near each other, the middle-lateral distances being relatively very small, hardly greater than the distance between the dorsal setae. Median-dorsal distance nearly equals the half circumference of the body. (At the middle of the body  $aa:ab:bc:cd:dd$  approximately equals 6:5:1:1:20.)

Nephridiopores close below the lines of setae *d*.

Clitellum dark purple-brown ring-shaped on segments XIII to XVIII (= 6), feebly developed on the thirteenth and eighteenth segment.

Sexual pores all inconspicuously paired.

Secondary male pores in the bottom of hardly recognizable enlargements of the intersegmental furrow XVII/XVIII above the lines of setae *b*.

Female pores in the intersegmental furrow XIV/XV in the lines of setae *c* or near them (recognized only in sections).

Spermathecal pores. Long, but narrow slits in the intersegmental furrow XXI/XIII above the lines of setae *b*.

Septum V/VI thin, VI/VII rather thin, VII/VIII to XI/XII moderately thick, the succeeding ones thin.

Alimentary canal: A rather large gizzard in the fifth segment. Three stout pear-shaped unpaired chylous pouches depend ventrally in the ninth, tenth and eleventh segments from the oesophagus. They are panicled tubular pouches without a distinct basal lumen; with very numerous, perhaps 200 or more, chylous tubes,

pressed together closely and parallel. Paired chylous pouches, lamellar pouches, laterally on the oesophagus in the thirteenth segment. Intestine without a typhlosole.

Anterior male organs holoandrous. Two pairs of massive seminal vesicles, having short stalks, depending from the septa X/XI and XI/XII into the eleventh and twelfth segments; they are broad and short sacs, externally uneven. Two pairs of sperm reservoirs in the posterior part of segments X and XI, lateral to the oesophagus. They are light yellowish white, with a metallic luster, being densely filled with sperm. Their main part is bluntly club-shaped, thickest in the upper part, with not quite regularly alternating lateral incisions inclining to a serpentine form. Their ends are continued into moderately long, thin, irregularly bent tubes. The tubes at the upper end pierce through the succeeding septum (X/XI or XI/XII) and enter the seminal vesicles, here ending in rather small male funnels. The tubes at the lower end extend backward and are continued into typical male ducts.

Posterior male organs (Fig. 12): Opening the worm by a dorsal longitudinal incision, spreading the body-wall, and removing the intestine, there are visible, in addition to the ventral nerve cord, two thick cylindrical muscular organs with a lustrous surface, extending backward from each male pore through several segments. They lie parallel to each other and are approximately equal in length (about 5 mm.) and width (about 0.7 mm.). The medial one is the glandular part of an euprostate (*eu*), the lateral one a penial pouch (*pp*). The entally regularly rounded euprostate (*eu*) has a simple, rather narrow lumen, in a transverse cleft with a flattened-elliptical contour; it is invested with a thin, smooth epithelium of very delicate and slender cylindrical cells. Externally the euprostate is enveloped by a moderately thick muscular mantle. The thick layer between this mantle and the epithelium is built up of slender, radially arranged glandular cells: I could not recognize with complete certainty at what point the male ducts (*md*) enter the lumen of the euprostate; but I saw in the glandular layer of the ental end of the euprostate a curved cord, crossing the radially placed glandular cells, and obviously tending toward the ental end of the lumen of the euprostate. I can hardly be mistaken in considering this cord as a tangential section through a male duct, which enters the ental end of the euprostatic lumen. The ectal end of the glandular part of the euprostate narrows conically, and is continued into a thin tube-like, muscular duct. After some irregular serpentines this duct enters the wall of the penial pouch (*pp*) rather close above the ectal end of it. The wall of the penial pouch is muscular, but the muscles, which are principally transverse, do not form a dense, firm mantle as on the glandular part of the euprostate. The ental end of the penial pouch is not rounded, but is continued into a muscular tuft, soon getting narrower and presumably serving as a retractor of the penial pouch. Yet it must be noted that I could not determine whether this tuft was inserted at the body-wall. The lumen of the penial pouch is rather wide, with an approximately circular outline. The duct of the euprostate, entering the penial pouch near its ectal end, extends, soon getting thinner, in the wall of the pouch nearly as far backward as the ental end of the penial pouch. Here, becoming thicker again, it turns in a sharp bend inward and ectally, and enters the lumen of the pouch, forming the ental end of a penis. The penis (*p*), thus inserted in the ental end of the penial pouch, is very long, and so thick that it nearly fills the lumen of the pouch throughout its length. It shows many narrow serpentines, only marked by alternating incisions in its flanks. Stretched out, it would be conspicuously longer than the

pouch. Toward its ectal end it gets gradually thinner and finally ends in a narrowly rounded tip. I could not detect any muscular elements in the penis. The main part of its wall is formed of very delicate radially arranged fibres of questionable nature. Its lumen, the continuation of the euprostate axial channel, is very narrow, invested by a very fine epithelial layer, and discharges at the ectal tip through the primary male pore. Doubtless the penis is pushed out during the copulating act, to enter the spermathecal atrium. As it has no noticeable muscles, its entrance into the spermatheca must be regarded with more probability as taking place by being drawn in by the muscular spermathecal atrium. This euprostate apparatus recalls the corresponding organs of *Malodrilus neumanni* Michaelsen (1903, p. 473, Pl. xxiv, fig. 14). But in that species euprostate and penial pouch are not parallel to each other, each being curved in circular form one behind the other, and the euprostate duct enters, not the ectal, but the ental end of the penial pouch.

Female organs and spermathecal apparatus (Fig. 11). The spermathecal pores lead each into a large, cylindrical, muscularly lustrous spermathecal atrium (*sa*), the ectal end of which is narrowly conical, whilst entally, after narrowing a little in the beginning, it is continued into a thick pear-shaped ampulla. The spermatheca first extends a little toward the median line from its discharging pore, then bends upward and soon backward through several segments as far back as to the region of the euprostates, overlapping the female organs in segments XIII and XIV. The wall of the spermathecal atrium is very thick, muscular, with a moderately wide lumen, and narrowed longitudinal septum-like prominences. The ampulla has a thin wall, and in the specimen examined is filled by a rather coarse granular mass, colored dark red by haematoxylin-eosin. Medial to the ascending part of the spermathecal atrium a large, somewhat irregularly formed ovarian bladder (*ob*) is attached, the medial wall of which is rather far separated from the ventral nerve-cord (*vn*). This ovarian bladder which reaches, without diminishing in width, as far as the septum XIII/XIV, is almost completely filled by a large, lobed ovary (*o*) and a massive, rolled up female funnel (*ff*) lying in its posterior part. The lumen of this funnel shows the complicated structure usually found in the eudrilines. At its broader medial pole the funnel seems to open by a narrow slit into the ovarian bladder (not quite distinctly seen). At its posterior side it bears an egg sac with a short and narrow stalk (*es*), projecting into the fourteenth segment. The surface of the egg sac is made very uneven by the projecting egg chambers, each containing an egg cell about  $25\mu$  in diameter. The more contracted lateral pole of the female funnel, narrowing conically, is continued into the female duct (*fd*). At the indistinct demarkation between female funnel and duct, and posterior to them, there is a small, widely pear-shaped sperm chamber (*sr*), projecting only a little, and discharging ectally into the female duct. This duct, at first conically narrowed, soon bends backward and extends, getting thinner and thinner, and clinging to the body-wall, as far as the intersegmental furrow XIV/XV. There it bends laterally and pierces the thick body wall perpendicularly, discharging finally through the narrow female pore. I could not recognize any communication between the spermatheca and the female organs, which are closely adherent to it.

#### ***Eminoscolex langi*, new species**

Figures 1, 10

LOCALITY.—Belgian Congo, Medje at the River Nava, northern affluent of the Aruwimi River,  $2^{\circ} 25'$  north lat.,  $27^{\circ} 20'$  east long.; Lang-Chapin Congo Expedition.



**MATERIAL AVAILABLE.**—A specimen without clitellum, but otherwise mature, having already copulated, which is the type (Cat. No. 2254, American Museum of Natural History).

**DESCRIPTION.**—Dimensions: length 110 mm., thickness throughout most of length 3.5 mm.; number of segments about 156.

Color brownish gray, dorsally only a little darker than ventrally.

Body cylindrical. Head epilobous (about  $\frac{2}{3}$ ). Dorsal appendage of prostomium posteriorly closed by a transverse furrow, the lateral borders a little converging backward.

Setae moderately stout, at the middle part of the body 0.35 mm. long and  $25\mu$  thick, slightly curved in an S-form, with a nodule somewhat ectal to the middle point. The ventral setae are widely paired, almost separated; the dorsal setae are rather strictly paired. The middle lateral distances are about equal to the median ventral; the median-dorsal distance approximately equals half the circumference of the body. At the middle part of the body *aa:ab:bc:cd:dd* approximately equals 8:6:8:3:42.

Nephridiopores between the lines of setae *c* and *d*.

Dorsal pores are wanting.

Clitellum not yet developed.

Sexual pores all inconspicuous, paired.

Secondary male pores at the intersegmental furrow XVII/XVIII, between the lines of setae *b* and *c* in the bottom of hardly noticeable widenings of the intersegmental furrow.

Female pores only seen in a series of longitudinal sections. They are placed at the intersegmental furrow XIV/XV between the lines of setae *c* and *d*, approximated to the latter.

Spermathecal pores at the intersegmental furrow XII/XIII, just above the lines of setae *b*; and resembling the secondary male pores in appearance.

Septum V/VI very thin, VI/VII a little thicker, VII/VIII to XI/XII rather thick, XII/XIII moderately thin.

Alimentary canal: A large elongate barrel-shaped gizzard in the fifth segment. Oesophagus equally and moderately wide. In each of the ninth and tenth (as well as in the eleventh (?)) segment a thick, club-shaped unpaired chylous pouch depends from the ventral side of the oesophagus, being attached to it by the thinner ental end. I did not recognize such a pouch in the eleventh segment. Presumably it was torn off and lost when I dissected the worm. The unpaired chylous pouches are paniced tabular pouches without a distinct basal lumen, with very numerous, thin chyle tubes, lying parallel and pressed together. In segment XIII two thick, irregularly kidney-shaped paired chylous pouches with some incisions in the convex border, are situated at the sides of the oesophagus. They are pouches with broad, closely arranged ridges. The intestine begins in the fifteenth (?) segment with a sudden enlargement. It has no typhlosole.

Anterior male organs holoandrous: Two pairs of seminal vesicles depend backward from the septa X/XI and XI/XII. Those of the anterior pair are restricted to the eleventh segment; they are irregularly sac-like, moderately long, with a thin, upwardly bent basal part and a broad, backwardly bent middle and apical part, with some deep incisions. The seminal vesicles of the hinder pair have a quite different form. They reach backward as far as the twenty-first segment, if not farther. In piercing the septa, they are thin and tubular, in each of the intervening segmental

parts they enlarge to a pair of flat, nearly semicircular, lateral pouches, the whole organ having somewhat the appearance of a fern leaf, the arrangement (but not the contour) of the side-leaves resembling that of the common *Polypodium*. Two pairs of sperm reservoirs in the tenth and eleventh segments; they are thin-walled tubes, partly moderately wide, partly very wide, irregularly wound and meandering, the windings being pressed together to form a nearly compact elongate mass with an irregular contour. The ental ends of the sperm reservoirs, piercing the hinder septa of their segments, enter the seminal vesicles.

Posterior male organs (Fig. 10): The glandular part of each euprostate forms a narrow loop, stretching straight backward as far as to enter segment XXIII. The ental branch of this loop is a little shorter than the ectal one, to which it is closely adherent. The free edges of these somewhat flattened branches are deeply incised in the intersegmental parts, but expand in a nearly semicircular outline in the segmental parts. The glandular part of the euprostate has a thick glandular layer and a narrow axial canal, but no noticeable muscle layer. The two male ducts (*md*) of one side are closely joined to each other, but not united. They enter the regularly rounded top of the ental branch of the glandular part of the euprostate. The ectal branch of the latter is continued into a much thinner, moderately long duct, which runs straight forward. This duct is externally smooth and its mantle contains muscles which are mostly longitudinal. The rather narrow axial canal is bent in some broad undulations. The duct then enters a nearly globular bulb (*mb*), which must be regarded as a muscular penial pouch (*pp*). It appears to consist mainly of irregularly felted muscles which cannot be separated distinctly into transverse and longitudinal ones. The lumen of the penial pouch is narrow, totally restricted to the ectal part of it, and nearly filled by a broad, obtuse conical penis. The axial canal of the euprostate, after piercing the bulb of the penial pouch, discharges through the primary male pore at the rounded apex of the penis.

Female organs and spermatheca (Fig. 1): Each spermathecal pore leads into a short thick tubular spermathecal atrium with a thick muscle layer and a narrow axial canal, a transverse section of which shows an irregularly stellate contour. Soon after, having entered the body cavity, this atrium enlarges to a thin-walled ampulla (*sp*), egg-shaped in the ectal half, (*sp*). It is about 1.8 mm. thick, and is continued entally into a tubular part nearly equally long and about 0.6 mm. thick, which gets still thinner at the incurved extreme end. The wall of the ampulla is rather thin. The material contained in the ampulla is peculiar. It consists mainly of spermozeugmas of a more or less regular cylindrical or club-shaped form. They are about  $\frac{1}{3}$  mm. long and  $75\mu$  thick. Their apparently structureless axial cord is densely and regularly beset with obliquely arranged spermatozoa, the slender tails of which project freely. These spermozeugmas do not lie irregularly in the lumen of the ampulla, but are attached to the wall of the ampulla by their thinner end and form a close investment about it. Only in the spacious ectal half of the ampulla do they project straight into the lumen, but they leave the inner part of it free. In the narrower tube-like part they fill the whole space, being closely pressed together and irregularly bent and curved to accommodate themselves to the available space. The free middle part of the ectal half of the ampulla contains delicate granulations, doubtless secretions of the glandular cells of the ampulla. The whole spermatheca is enveloped by a very thin coelomic membrane (*c*), which is attached to it quite closely only at its basal part, and which presumably is in connection with the ovarian blad-

der. At each side of the ventral nerve-cord an ovary (*o*) is attached at the margin of septum XII/XIII, and extends from here obliquely laterally into the thirteenth segment. The ovary is narrow at its base, very much enlarged in its middle and apical parts. The largest egg cells of the ovary (already partly free) are about  $25\mu$  in diameter. The ovary is rather closely enveloped in a thin-walled ovarian bladder (*ob*), which is entally continued into a short and moderately wide ovarian tube. This soon enlarges to a moderately wide female funnel bladder. The thin wall of the latter extends backward, here enveloping the medial side of the neighboring spermatheca, or rather, the thin coelomic envelope of it. Presumably the lumen of this ental part of the female funnel bladder is in communication with the spermathecal chamber, formed by the coelomic membrane enveloping the spermatheca. In its lateral part the female funnel bladder contains a bluntly pear-shaped, rolled up female funnel (*ff*). The broad medial pole of this funnel opens through a narrow slit into the female funnel bladder, while the narrower lateral pole is continued into a thin female duct (*fd*). This duct extends a little way laterally and then bends upward and backward, and finally discharges, after piercing the body wall in a straight transverse direction, through the corresponding narrow female pore. The female funnel bears at its hinder wall a kidney-shaped egg-sac (*es*), which is externally very uneven because of the projection of the egg chambers. The short, narrow stalk of the egg sac pierces the wall of the female funnel bladder, in connection with septum XIII/XIV, so that the egg sac projects into segment XIV. At the point where the female duct joins the female funnel a simple, widely pear-shaped sperm chamber is developed which projects only a little over the posterior side of the female funnel.

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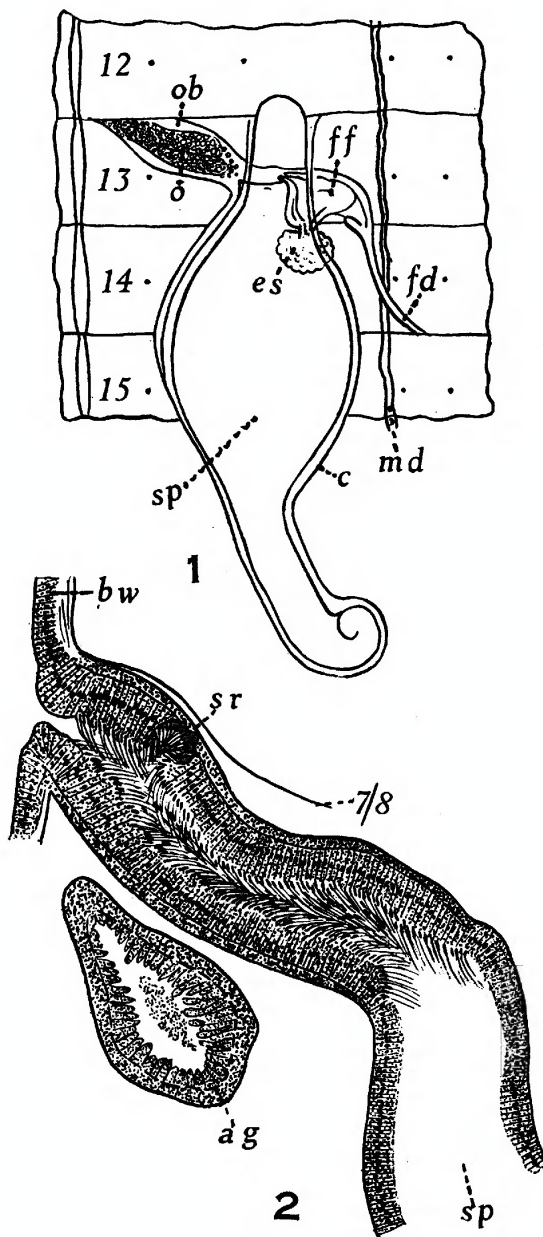


Fig. 1. *Eminoscolex langi*. Female organs and spermathecal apparatus of the right side (schematic),  $\times 15.9$ .

*c*, coelomic membrane enveloping the spermatheca; *es*, egg sac; *fd*, female duct; *ff*, female funnel; *md*, male duct; *o*, ovary; *ob*, ovarian bladder; *sp*, spermatheca.

Fig. 2. *Andiorrhinus duidanus*. Longitudinal section through the ectal part of a spermatheca,  $\times 62$ .

*ag*, accessory glandular pouch; *bw*, body-wall; *sr*, sperm chamber;  $7/8$ , septum VII/VIII.

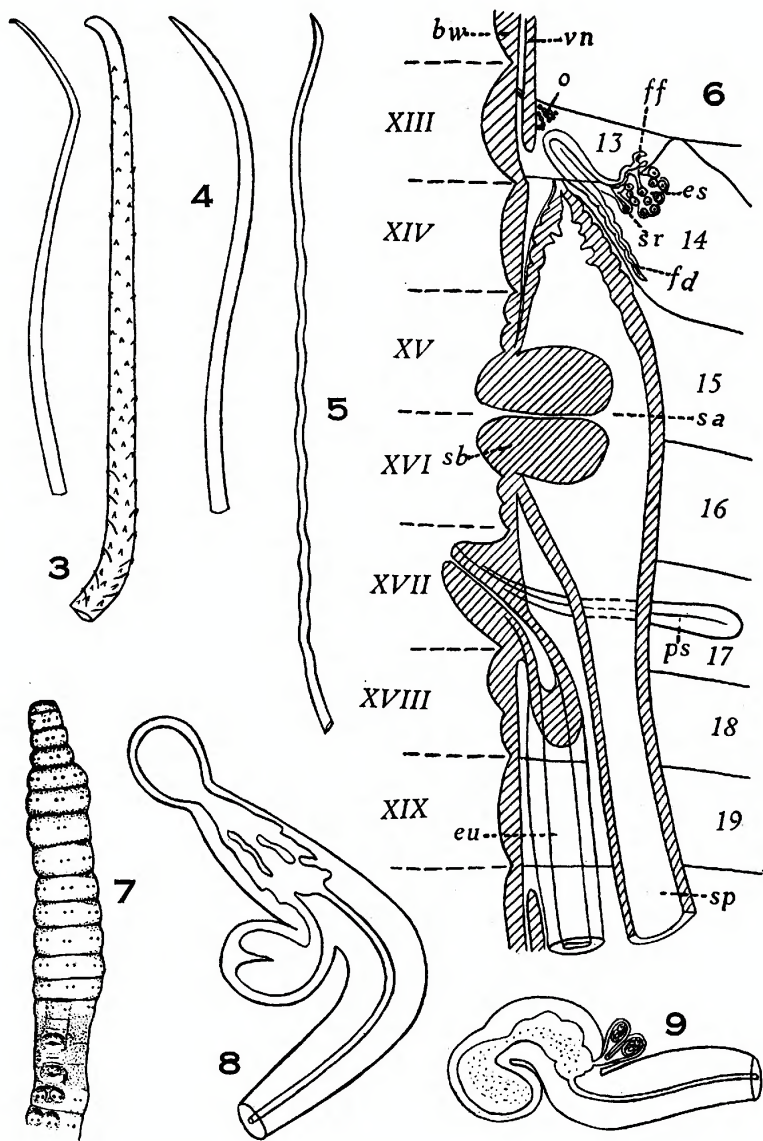


Fig. 3. *Dichogaster navana*. Penial seta,  $\times 33$ , and ectal part of the same,  $\times 165$ .

Fig. 4. *Stuhlmannia congica*. A penial seta,  $\times 52.3$ .

Fig. 5. *Dichogaster chapini*. Ectal part of a penial seta,  $\times 146.6$ .

Fig. 6. *Stuhlmannia congica*. Right side of the ventral part of the body in the sexual region, opened by a main sagittal section,  $\times 33$ . The plane of the section is distinguished by hatching.

*bw*, body-wall; *es*, egg sac; *eu*, euprostate; *fd*, female duct; *ff*, female funnel; *o*, ovary; *ps*, penial seta sac; *sa*, spermathecal atrium; *sb*, spermathecal bulb; *sp*, spermatheca; *sr*, sperm chamber; *vn*, ventral nerve-cord.

Fig. 7. *Stuhlmannia congica*. Fore body from the ventral side,  $\times 5.8$ .

Fig. 8. *Dichogaster navana*. Spermatheca, shown as though transparent,  $\times 29.3$ .

Fig. 9. *Dichogaster chapini*. Spermatheca shown as though transparent,  $\times 40.3$ .

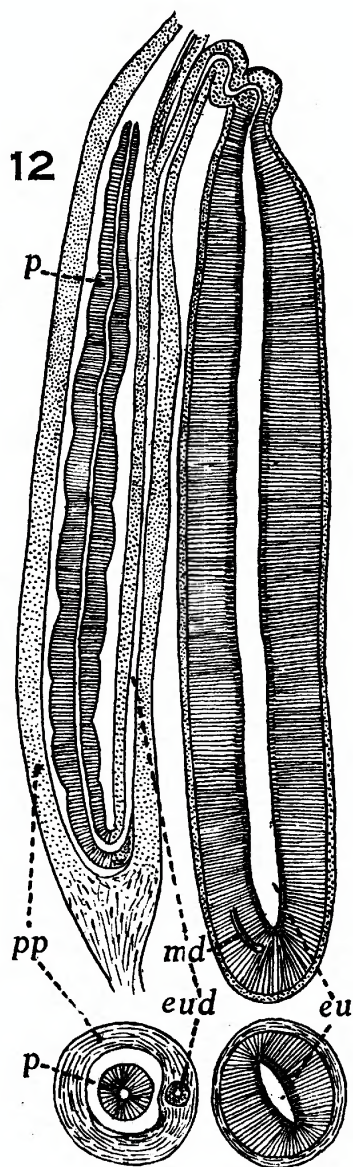
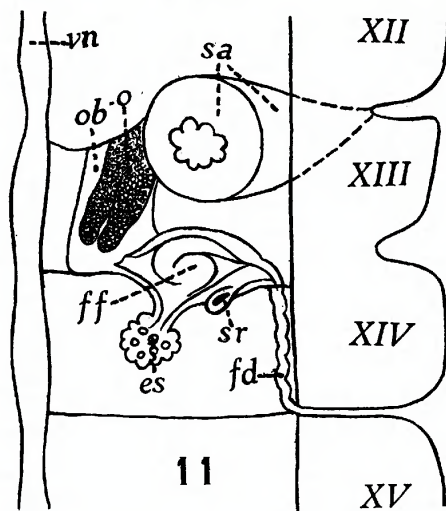
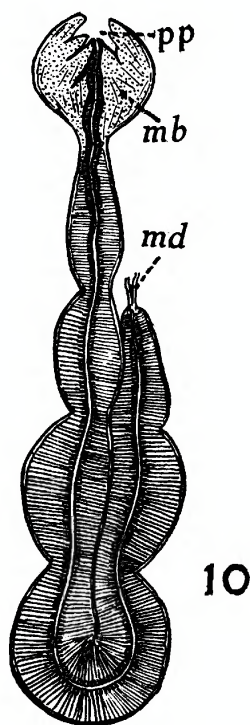


Fig. 10. *Eminoscolex langi*. Euprostate apparatus in an optical horizontal section (schematic),  $\times 15.2$ .

*mb*, muscular bulb; *md*, male ducts; *pp*, penis pouch.

Fig. 11. *Eminoscolex navanus*. Ventral part of the right side of the sexual region, opened by a horizontal section, which cuts off the ental part of the spermatheca. (schematic),  $\times 25.4$ .

*es*, egg sac; *fd*, female duct; *ff*, female funnel; *o*, ovary; *ob*, ovarian bladder; *sa*, spermathecal atrium; *sr*, sperm chamber; *vn*, ventral nerve cord.

Fig. 12. *Eminoscolex navanus*. Longitudinal and transverse section through the euprostate-penial apparatus,  $\times 22$ .

*eu*, euprostate; *eud*, euprostate duct; *md*, male duct; *p*, penis; *pp*, penis pouch.

